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THERAPIES

HEADING: Clinical pharmacology

Self-medication practices and their characteristics among French university students

Self-medication among university students

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Summary

Background.- Inappropriate self-medication can have major impacts on health. The aim of the study was to describe the prevalence and characteristics of self-medication behaviours among undergraduate and postgraduate students from various academic sectors. We also sought to identify determinants of inappropriate self-medication. *Methods.*- We performed a descriptive, cross-sectional study based on a self-questionnaire filled out by students from various academic sectors at the University of Picardy (Amiens, France). The survey comprised four sections: sociodemographic characteristics, health status, self-medication behaviour (including the names of medications taken), and knowledge about medications and the risks associated with self-medication. Inappropriate self-medication was defined as the reported administration of a prescription-only medication without a current prescription. *Results.*- A total of 1257 students (715 from the health sector and 542 from other sectors; 983 (78.2%) women) completed the survey. 1194 (95%) students reported self-medication. The most reported reason for self-medication was a supposed good knowledge of medications. The most frequently administered drug classes were analgesics (n = 736, 46.7%), and anti-inflammatories/antirheumatics (n = 299, 19%). 51.7% (n = 617) of the self-medicating students used a medicine from an old prescription including prescription-only drugs (mostly analgesics, antibiotics, and anxiolytics). Female sex, studying for a healthcare degree, having a chronic disease, smoking, having a healthcare professional in the family, and stress were all independently associated with inappropriate self-medication behaviours. *Conclusion.*- Our results showed that self-medication in general and the use of old prescription-only medications in particular are frequent among French university students. At-risk situations identification might facilitate the implementation of educational actions.

KEYWORDS

Self-medication; Student; Prescription medication; Health care; Stress

Abbreviations

ATC: anatomical therapeutic chemical

CI: confidence interval

OR: odds ratio

NSAIDs: non-steroidal anti-inflammatory drugs

Introduction

Although there is no consensus definition of self-medication [1], it usually corresponds to the self-administration of a medication in the absence of a current prescription and/or without consulting a healthcare professional. Self-medication is usually employed for minor ailments that people diagnose and treat themselves, and means that people have a more active role in caring for their own health [2]. Self-medication has also been viewed as a coping strategy - especially in patients with a chronic health condition [3,4].

In a global context of an increasingly medicalized society, self-medication appears to be common in both developed and developing countries [1,5-7]. Self-medication has often been linked to the use of non-prescription (i.e. over-the-counter, OTC) drugs. In France, OTC drugs accounted for almost 13% of total pharmaceutical sales in 2016, although this is half the European average [8]. However, self-medication extends beyond the use of OTC drugs, and can include the use of prescription-only drugs obtained from a third party or purchased on the Internet [1,5,9,10].

Although “responsible” self-medication (i.e. the use of appropriate drugs, such as OTC drugs) is encouraged by some governments because it might reduce healthcare costs, it is not risk-free; OTC drugs can be misused (adverse effects, microbial resistance, drug interactions, addiction, abuse, etc.) [6]. There are few published pharmacovigilance data on self-medication practices [1,10,11]. Hence, the identification of factors linked to inappropriate self-medication is an important topic.

Self-medication concerns all age groups, from children through to young adults and older adults [12,13]. However, few studies have focused on self-medication among student populations in developed countries. For example, the prevalence of self-medication among students in France is not known; the literature data on this topic were collected from students in other countries [5,9]. Student life is associated with major lifestyle changes. Exams and worries about their future increase students’ stress levels and make them more likely to self-medicate [14].

Moreover, few studies have focused on reasons for self-medication among students, the students’ profiles, and factors potentially associated with inappropriate self-medication [5,8,9]. We

considered that it is important to focus on self-medication behaviours that might be inappropriate due to their potential consequences (e.g. adverse drug reactions and lack of efficacy). Hence, in the present study, inappropriate self-medication was defined as self-reported medication with a prescription-only medication in the absence of a valid prescription.

The objective of the present study (performed in France) was to describe the prevalence and characteristics of self-medication behaviours among undergraduate and postgraduate students from various academic sectors. We also sought to identify determinants of inappropriate self-medication by studying self-medication behaviours involving prescription-only drugs.

Methods

We performed descriptive, cross-sectional survey of undergraduate and postgraduate students from various academic sectors at the University of Picardy (Amiens, France). The survey was based on a secure, anonymous, self-questionnaire available online (<https://framaforms.org/>) for a 4-month period (from March to June 2019). To encourage students to fill out the questionnaire, the survey was publicized via several student Facebook groups from Amiens, during lectures, and on the university library's website.

We surveyed second- and third-year Bachelor's degree students and Master's degree student. First-year Bachelor's degree students were excluded because in France, examination practices differ from one faculty to another; for example, health sector students may have to sit a pass/fail examination at the end of their first year. Students from the faculties of pharmacy, medicine, nursing and midwifery were referred to as "health sector students". The other students came from psychology, law, language and science departments.

The survey comprised a total of four sections, on (i) the students' sociodemographic factors (sex, age, academic sector, living status, the presence of a healthcare professional among the family members and friends) (ii) self-evaluated health status (chronic disease, smoking habit, alcohol consumption, and stress in the previous month) (iii) self-medication behaviour (including open questions where respondees could give the names of medications used in self-medication), and (iv) knowledge about medications and the risks associated with self-medication. For each question, students could check one or more boxes or give their answers as free text (Annex 1). A pharmacist subsequently coded the reported names of medications according to the anatomical therapeutic

chemical (ATC) 2nd level classification, and classified the medications as prescription-only or OTC. Inappropriate self-medication was defined as the reported administration of a prescription-only medication without a current prescription.

This survey underwent preliminary testing on a representative sample of 20 students, in order to (i) estimate the time needed to fill out the survey, and (ii) optimize the formulation of certain questions.

According to French legislation, approval by an independent ethics committee was not required because the study involved anonymous data and the participants agreed to participate on the first page of the questionnaire.

Statistical analysis

Descriptive statistics were reported for the main study variables. Results were expressed as mean \pm standard deviation (SD) or the number (percentage). Data by academic sector (e.g. health subjects vs. other subjects) or by other intergroup were compared using a Chi-squared test. Univariate and multivariate logistic regression analyses were used to examine the factors related to self-medication with a prescription-only drug. The multivariate logistic model included variables that were statistically significant in univariate logistic models (including sex, university type, health status, chronic disease, smoking habit, having a healthcare professional among family and friends, and stress). Lastly, the adjusted odds ratio (OR) and its 95% confidence interval (95% CI) were calculated to assess associations between independent variables and self-medication with a prescription-only drug in the previous month. All statistical analyses were performed using SPSS software (version 18.0, SPSS Inc., Chicago, IL, USA) for Windows (Microsoft Corp, Redmond, WA, USA).

Results

Characteristics of the study population

The sociodemographic characteristics of the 1,257 students who filled out the questionnaire are summarized in Table 1. The majority of the participants were female (n = 983, 78.2%), and the median age was 21. Of the 1,257 participants, 715 (56.9%) were health sector students (mainly from the faculties of medicine and pharmacy), and 823 (65.5%) were studying for a Bachelor's degree. Forty-five percent (n = 570) of the participants lived alone, and 25.1% (n = 316) were still living at the family home. It is noteworthy that 50.4% (n=634) of the participants had at least one healthcare professional among family and friends. This proportion was higher among health sector students (61,8%) than among other students (n=38.2%) [p <0.0001].

Health profiles

The majority of participants considered themselves to be in excellent or good health (n = 1001, 79.6%), and 17.8% (n = 224) stated having a chronic health condition requiring long-term treatment with a medication. Most of the students (n = 1034, 81%) were non-smokers, and 754 (60%) of the students reported consuming alcohol (including 445 who consumed alcohol at least once a week). The majority of the student (n = 966, 76.8%) reported having experienced a stressful situation in the month preceding the survey. On average, the students slept for 7 hours a day (Table 1).

Self-medication behaviours

Among the 1,257 respondees, 1,194 (95%) stated that they had self-medicated (Fig. 1). The prevalence of self-medication was higher among females than males (p <0.001), and higher among health sector students than other students (ps<0.001) [Fig. 1]. About 39% of women (n = 365) and men (n = 95) first self-medicated when they were 15 to 18 years of age. With regard to the reported frequency of self-medication, 599 students (50.2%) reported self-medicating at least once a month; of these, 13.4% (n = 160) self-medicated at least once a week. However, a larger proportion (n =

439, 36.8%) self-medicated once a month. The reported prevalence of self-medication was higher among students with a healthcare professional in the family and friends than among the other students ($p < 0.0001$). The reasons for using self-medication reported by the study participants are summarized in Fig. 2. The most frequently stated reasons were a supposedly good knowledge of medications ($n = 943$, 79% of the participants), and symptoms that were not serious enough to justify a doctor's appointment ($n = 872$, 73%). One hundred and forty students (11.7%) always self-medicated before an exam; 75.7% ($n = 106$) of these students came from the health sector.

Almost all of the 1,194 self-medicating students obtained the drugs from the family medicine cabinet ($n = 893$, 74.8%) or from the pharmacy ($n = 880$, 73.7%). The information about medications came variously from the package leaflet ($n = 922$, 77.2%), the pharmacist ($n = 497$, 41.6%), relatives ($n = 459$, 38.4%), university classes ($n = 396$, 33.2%), and the Internet ($n = 222$, 18.6%). A large proportion ($n = 758$, 63.5%) of the self-medicating students mentioned this activity to their doctor (always in 60.7% of these cases [$n = 460$], and often in 26% [$n = 197$]).

Overall, 841 of the 1,257 students who filled out the questionnaire (66.9%) reported self-medication in the previous month (Fig. 3); 62% ($n = 521$) of these were health sector students. The most frequently reported symptoms leading to self-medication were pain ($n = 769$), fever or a cold ($n = 313$), stress/anxiety ($n = 98$), a sleep disorder ($n = 96$) and nausea/vomiting ($n = 69$). Accordingly, in the 1,575 drugs cited as self-medication, the most frequently self-administered ATC classes were analgesics ($n = 736$, 46.7%) and anti-inflammatory/antirheumatic drugs ($n = 299$, 19%). Most of the self-medication involved OTC drugs (mainly paracetamol and ibuprofen).

Inappropriate self-medication

Furthermore, 51.7% ($n = 617$) of the 1,194 self-medicating participants used a medication from an old prescription (Fig. 3); 54.3% ($n = 335$) of these participants were health sector students. The 617 students reporting self-medication from an old prescription cited 767 drugs, of which 340 (44.3%) were prescription-only drugs (Fig. 2); the three most frequently mentioned types of drug (by ATC class) were analgesics, antibacterial drugs and psycholeptic drugs (of which 64% [$n = 87$] were

anxiolytics) [Fig. 4]. For antibacterial drugs and psycholeptics, the proportion of prescription-only drugs was 87% (n = 258).

The factors associated with a risk of self-medication with a prescription-only drug are listed in Table 2. In a multivariate analysis, female sex, studying for a healthcare degree, having a chronic disease requiring long-term treatment, smoking, having a healthcare professional among family and friends and stress during the previous month were all independently associated with inappropriate self-medication (i.e. self-medication with a prescription-only drug). It is noteworthy that experiencing stress in the previous month was associated with the highest risk (OR [95% CI] = 2.54 [1.60-4.04]).

Knowledge about medications

The question with the highest proportion of incorrect answers concerned the contraceptive pill; 24.8% (n = 312) of students considered that the contraceptive pill was not a drug. Next, 15.5% (n = 195) of the participants considered that alcohol does not have a potential impact on medications, and 5.5% (n = 69) stated that tranquilizers could be used in self-medication. It is noteworthy that 97.5% (n = 1224) of the participants considered paracetamol as a drug with potential risks, 96.3% (n = 1210) knew that herbal medicines could cause adverse drug reactions, 97% (n = 1218) knew that antibiotics are not analgesics, and 98.3% (n = 1235) stated that some medications could lead to addiction. Even though health sector students were more likely to give correct answers (p <0.0001), 21.2% (n = 151) of them gave at least one incorrect answer.

Furthermore, 144 students believed that self-medication is not life-threatening (11.5%), 88 believed that it cannot lead to hospitalization (7%), and 51 believed that it cannot modify the effects of concomitant medications (4.1%). It is also noteworthy that 98.2% (n = 1235) of the participants knew that self-medication could lead to adverse drug reactions. Self-medication was considered to be potentially dangerous by 1,245 of survey responders (99%).

About half of the students considered that they were well informed about medications (n = 626; 49.8%); this proportion was higher among health sector students (n = 453, 72.4%) than among other students (n = 173, 27.6%) [p <0.001]. Almost all of the health sector students (n = 577,

86.6%) and very few of the other students (n = 89, 13.4%) had already attend to an intervention about medication (among the 666 students who answered this question).

Discussion

Our survey of 1257 students from various academic sectors showed that the great majority (n = 1194, 95%) reported self-medication. We found that 599 students (50.2%) reporting self-medicating at least once a month. It is noteworthy that 617 of the 1194 self-medicating students already used a drug from an old prescription; most of these were prescription-only drugs (mainly analgesics, antibacterial drugs, and psycholeptics). Of the factors independent linked to a risk of inappropriate self-medication with a prescription-only drug, stress in the last month had the strongest association.

Although our present results evidenced a very high self-medication rate (95%) among students, similar values have already been reported in studies of hospitalized patients and various age classes from the general population [12,15,16]. In studies of students, the self-medication rate varied from 55% to 99% [5,8,17,18]; however, most of these studies were performed in developing countries, where self-medication is more prevalent [17]. Prior to the present study, data on self-medication among students in a developed country were rare [12,16,19,20] and no data on French students were available. Here, we found a high prevalence of self-reported self-medication among students from a developed country. In a Spanish study, a high educational level was associated with self-medication in various age groups [20]. In the present survey, all the participants had a high educational level. These results indeed suggested that people with high educational level considered themselves more capable of making decisions about their health needs.

The prevalence of self-medication appears to be higher among students living in the family home than among those elsewhere [18,21]. In the present study, we found a higher reported prevalence of self-medication among students with a healthcare professional in the family. These students appeared to be more confident of their self-medication decisions than the others - probably because they assimilate the family member's medical knowledge as their own. Indeed, the statement "My father/mother is a doctor, so I know about these things" was frequently observed in the survey. Furthermore, many students considered that they did not need to see a doctor because

their symptoms were not serious and so could be treated with familiar medications. These reasons have also been reported in other studies [17,22]. In contrast, participations in the present survey were less likely to report cost and a lack of time as reasons for self-medication – the two main reasons in other studies [5,16]. Our results thus highlighted differences between developed and developing countries, where personal health behaviour depends on the type of healthcare system. Furthermore, we found that the prevalence of self-medication was higher among in health sector students than among other students. This high prevalence has been reported by some studies of medical students [22-24] but not by other studies [17,25,26]. Most of the respondees in the present survey were women; similarly some literature studies have reported a higher self-medication rate in women than in men [5,8,27,28] but others found no differences [18,20,24].

Lee et al. reported than students have a low overall level of knowledge about medication but that this level is higher among students with a healthcare professional in the family than in other students [27]. In the present study, the majority of students correctly answered simple questions about medications. However, some of the percentages were worrying lower; for example, almost a quarter of the students did not consider that the contraceptive pill was a medication, a fifth did not think alcohol can interact with drugs, and a fifth considered that psycholeptics can be use in self-medication. The high self-medication rate among health sector students might be linked to a high supposed level of knowledge about self-medication. However, the health sector students did not answer all seven questions correctly; 21% gave at least one incorrect answer. The World Health Organization found that people with a low level of knowledge about medications were exposed to several risks (such as incorrect self-diagnosis, overdosing, drug interactions, and inadequate use) that can lead to hospitalization or dependence [2]. However, it appeared that some students surveyed here were not aware of the risks incurred, since more than 10% did not think that self-medication can be life-threatening.

In line with the literature results, the most frequent symptoms leading to self-medication in the previous month were pain, a cold, and fever [7,18,27]. Accordingly, the most frequent drug class used for self-medication corresponded to analgesics – mainly paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen. It should be borne in mind that safety concerns have been raised about these two OTC drugs. Paracetamol overdose is associated with a risk of hepatotoxicity; the French Medicines Agency (*Agence nationale de sécurité du médicament et des produits de santé*) has already reduced the maximum packet size to 8 grams and plans to add a graphic warning on the box about the danger of overdosing [29]. Pharmacoepidemiological

studies have suggested that excessive use of NSAIDs is associated with an elevated risk of serious bacterial infections [30]; patients at risk of this serious adverse drug reaction might self-medication with NSAIDs. Self-medication with NSAIDs is becoming more restrictive in France: on May 20th, 2019, flurbiprofen became a prescription-only drug.

Self-medication from an old prescription

Antibiotics constituted the second most frequently reported drug class with regard to the reuse of old prescriptions. This inappropriate behaviour could induce individual and societal health problems - especially antibiotic resistance and the ineffectiveness of today's antibiotics. These problems can hinder infection control, increase costs, and lead to death [24]. Lescure et al.'s systematic review found that the dispensing of whole packages of antibiotics (instead of precise numbers) contributed to self-medication via the reuse of leftover antibiotics [19], which is happening in France. Furthermore, the results of the present study suggest that students do not consider the use of drugs from an old prescription to be self-medication.

Psycholeptics (mainly anxiolytics) constituted the third drug class most frequently reported drug class with regard to the reuse of old prescriptions. In line with literature reports, we found that these medications were taken especially during exam periods because of stress [1,2,31]. Self-medication with psychotropic drugs can lead to psychological damage, such as flashbacks, episodes of anxiety, confusion, and memory disorders [1,14]. In France, almost all psychotropic drug are available on prescription only. Another worrying aspect of specific self-medication with psycholeptics or analgesic opiates is the potential for addiction [32].

As in other surveys, we found that the risks associated with self-medication in the previous month with a prescription-only drug were female sex, alcohol consumption, smoking, and a healthcare professional in the family [14,27]. However, we also identified some novel factors, such as studying in the health sector, chronic disease with long-term treatment, and stress in the previous. Stress is a psychological disorder, and is one of the most common causes of psychological problems in individuals of all ages [33]. Student life can be stressful as a result of academic pressure, exams

pressure, living away from home (in most cases), personal issues, worry about the future, and other factors [34].

Although self-medication is widespread, there are few published data on adverse drug reactions resulting from this practice. Berreni et al. reported that the three drug classes most frequently cited in adverse event notifications associated with self-medication were analgesics, NSAIDs, and psychotropic drugs – the drug classes most frequently reported for self-medication in the present survey [10]. We consider that tools to prevent inappropriate self-medication should be developed. As reported by the students in the present survey, levels of awareness about the potential risks associated with self-medication are low. Hence, information campaigns about these topics in schools and universities might be of value. Healthcare professionals (particularly pharmacists and physicians) are key players in patient education. In developed countries (and notably France, where the present survey was carried out), healthcare systems reimburse all drugs under prescription in a global conditioning, which leads frequently to the presence of leftover drugs in the family medicine cabinet. Indeed, most participants in the present study obtain OTC or prescription-only drugs easily from the family medicine cabinet - as also shown in another French study [35]. Reimbursement of prescriptions as a function of the duration might help to reduce the extent of inappropriate self-medication with prescription-only drugs.

The present study had some limitations. The main difficulty was the heterogeneity of definitions of self-medication; these vary from one country to another as a function of drug regulations, access to healthcare, and health education. We choose a simple definition of self-medication: “use of a medication without consulting a healthcare professional”. In contrast, some researchers consider that the use of an old prescription does not constitute self-medication [1,20]. Secondly, the participant’s answers could not be independently verified, and so some aspects may have been underestimated. However, we sought to minimize recall bias by asking questions about self-medication in the previous month. Thirdly, the survey was performed in one region of France, and so the results are not necessarily representative of the French student population. However, we surveyed over a thousand students. Lastly, the students who answered the survey might have felt concerned about this topic, which might explain the high prevalence of self-medication among the respondees.

The present study also had several strengths. It was the first study in France to have specifically looked at the reuse of prescription-only drugs. Furthermore, we identified various types

of inappropriate self-medication behaviour and their determinants; this information might foster the development of health education measures for young people.

Conclusion

Most studies of self-medication among university students have been performed in developing countries, where inappropriate self-medication is a major problem; the present French survey provided novel data from a developed country. Our results showed that self-medication in general and the use of old prescription-only medications in particular are frequent among French university students. Our identification of at-risk situations associated with inappropriate self-medication might facilitate the implementation of specific, focused actions (e.g. educational actions).

Disclosure of interests

Authors have no competing interests to declare

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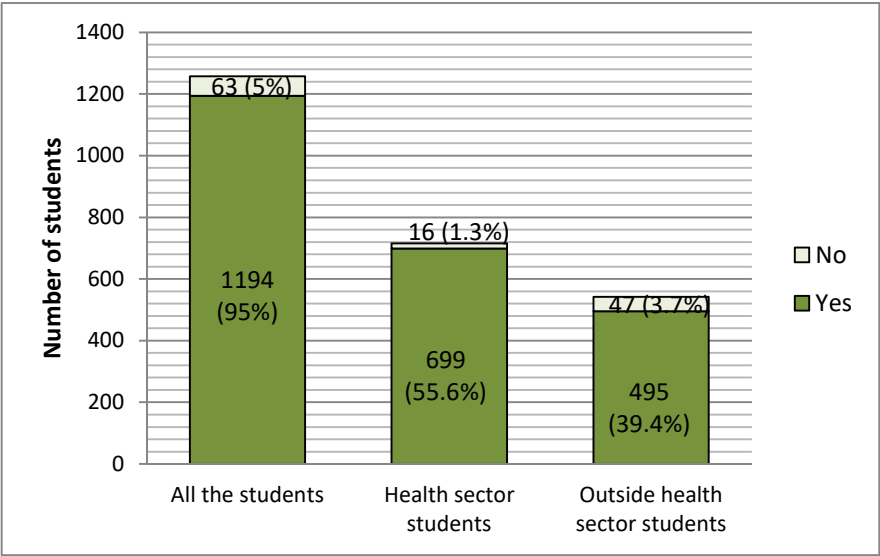
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Figure 1. Prevalence of self-medication by academic sector (n = 1257)



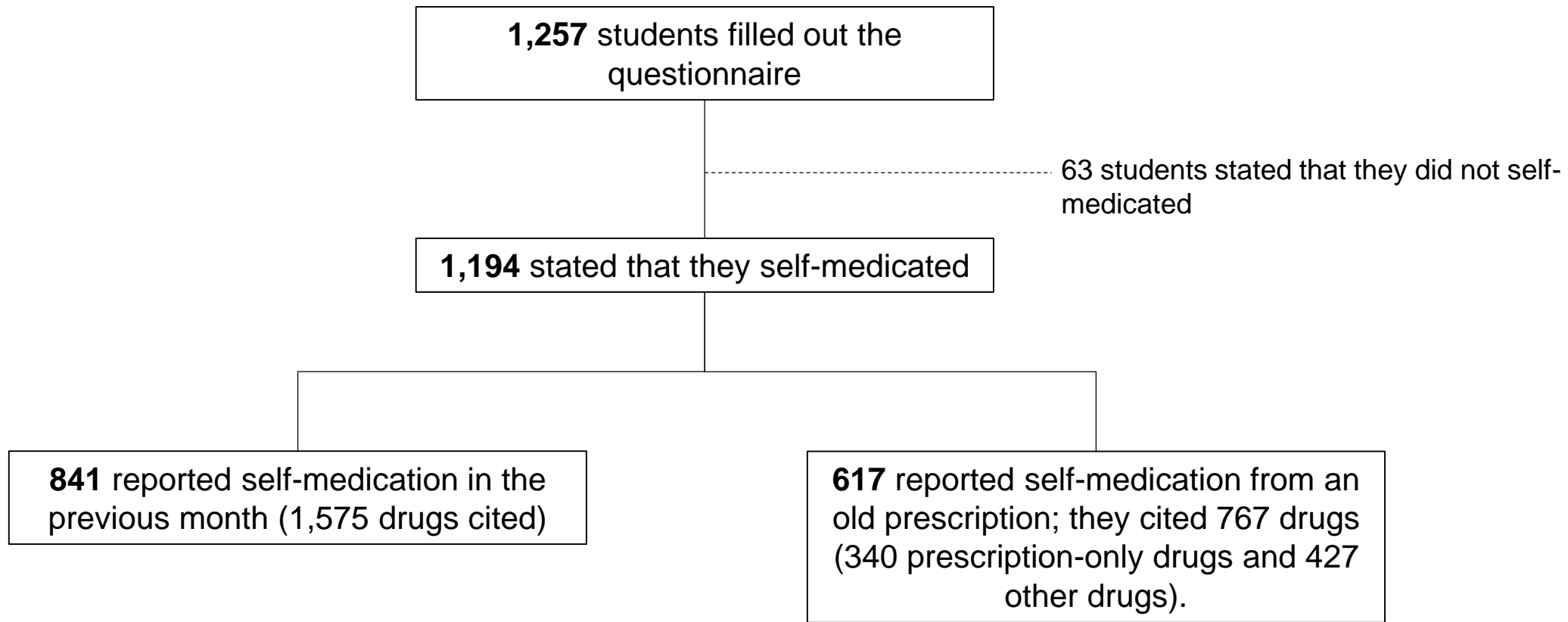


Figure 2, Study flow chart

Figure 3. Reported reasons for self-medication (n = 1194)

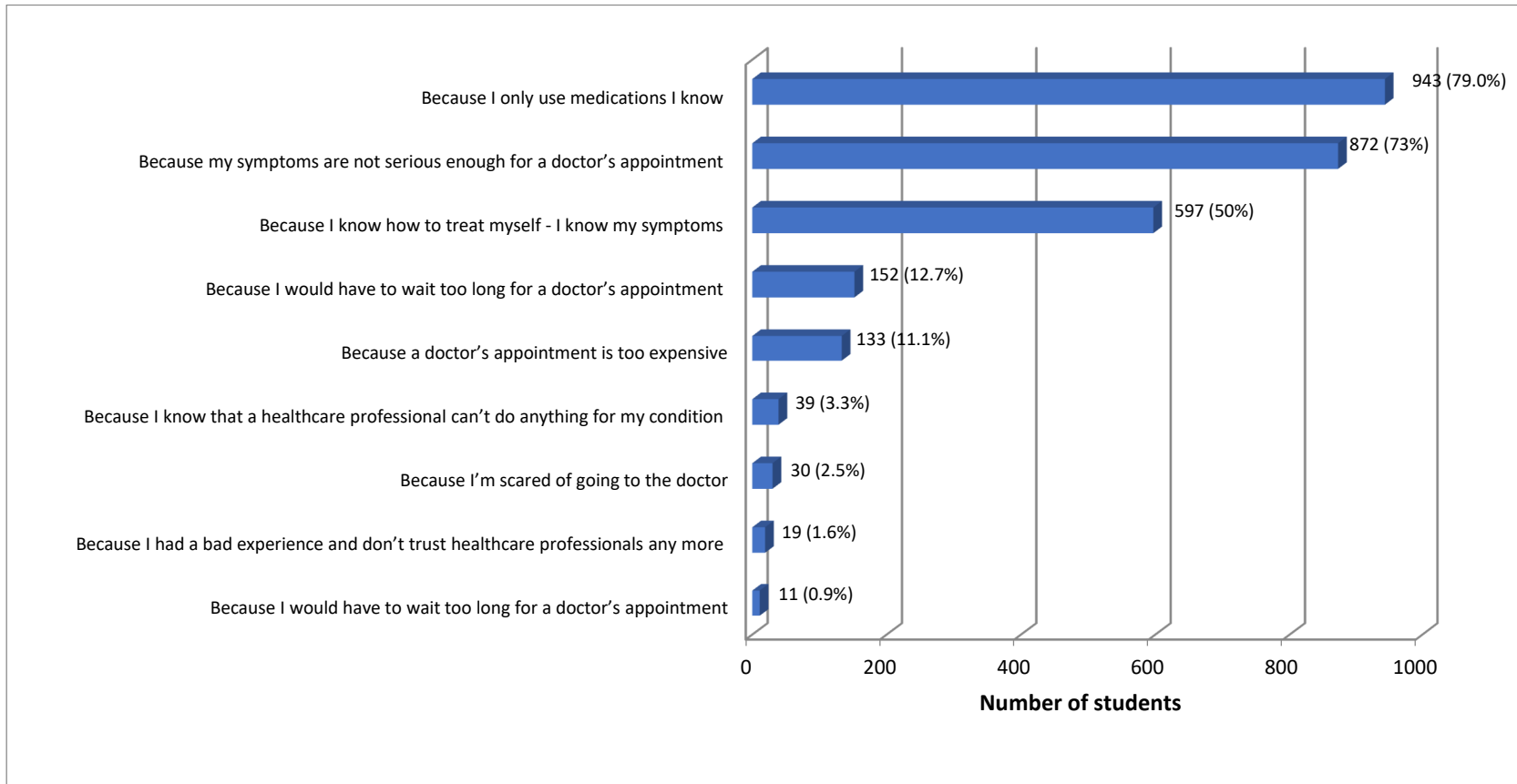


Figure 4. Use of medication from an old prescription, by ATC class (n = 767).

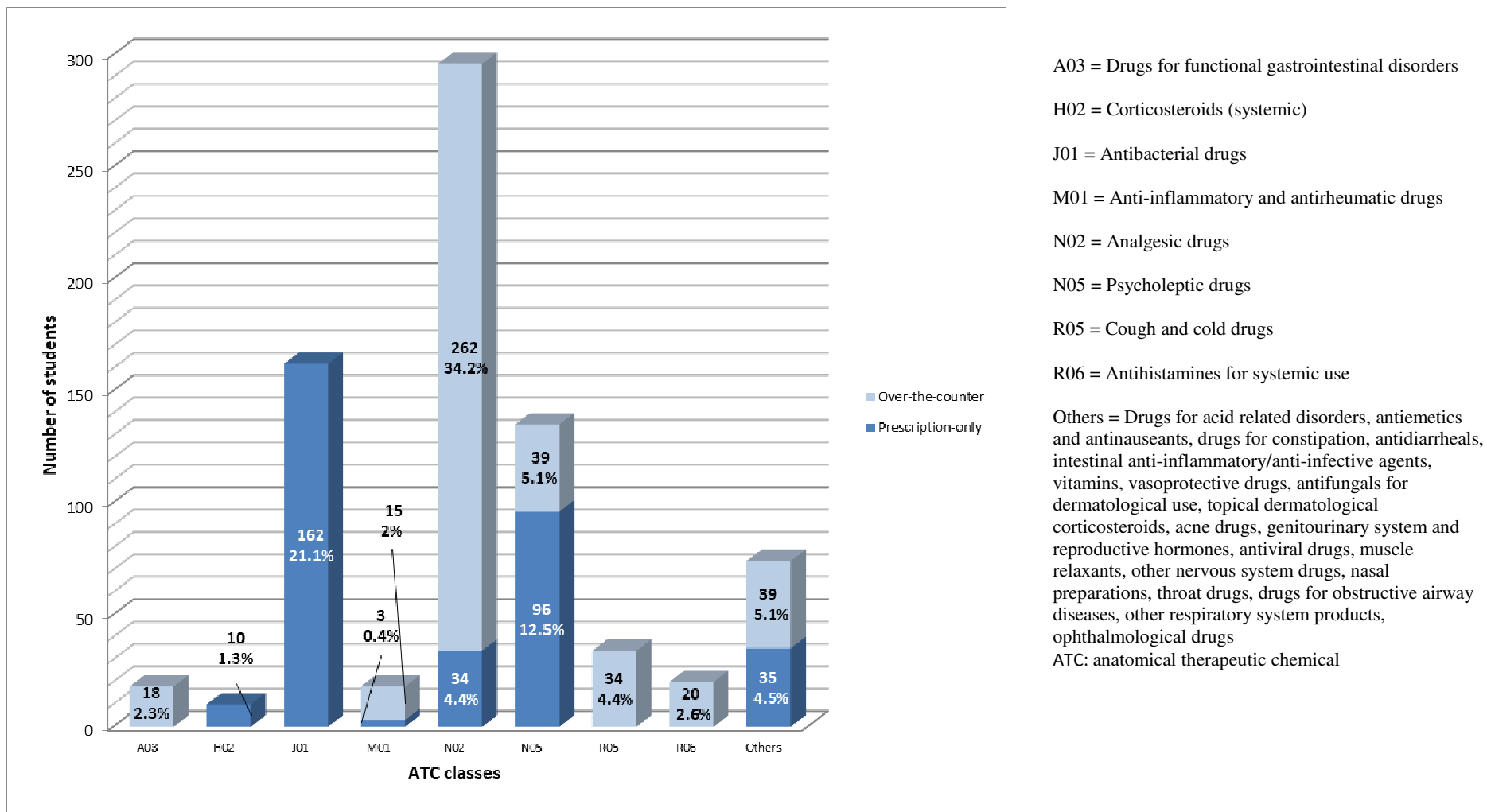


Table 1. Sociodemographic characteristics of the study participants

	All (n = 1257)
Age	
Mean \pm SD	21.7 \pm 3.1
Median [interquartile range]	21 [20; 23]
Sex, n (%)	
Male	274 (21.8)
Female	983 (78.2)
Academic sector, n (%)	
Health sector	715 (56.9)
Other	542 (43.1)
Levels of study, n (%)	
Bachelor's degree (second year)	439 (34.9)
Bachelor's degree (third year)	384 (30.5)
Master's degree (first year)	222 (17.7)
Master's degree (second year)	212 (16.9)
Living status, n (%)	
Alone	570 (45.4)
With their family	316 (25.1)
With a partner	249 (19.8)
With a flatmate	122 (9.7)
Self-reported health status, n (%)	
Excellent or good	1001 (79.8)
Average or poor	254 (20.2)
Chronic disease with long-term treatment, n (%)	224 (17.8)
Smokers, n (%)	239 (19.0)
Drinkers, n (%)	754 (60.0)
Alcohol consumption, n (%)	
Every day	33 (2.6)
About once a week	412 (32.8)
About once a month	282 (22.4)
About once a year, or less than once a year	24 (2.0)
Healthcare professional among relatives, n (%)	634 (50.4)
Relationship to the healthcare professional, n (%)	
First-degree relative	388 (30.9)
Second-degree relative	171 (13.6)
Third-degree relative	45 (3.6)
Friend or neighbour	30 (2.4)
Usual amount of sleep per day (mean \pm SD)	7 \pm 1.0
Stressful experience in the previous month, n (%)	966 (76.8)
Number of stressful experiences in the previous month, n (%)	
None	291 (23.2)
One	580 (46.1)
More than one	290 (23.2)

Table 2. Factors associated with self-medication with a prescription-only drug

Variables	Crude OR [95% CI]	Pval	Fully-adjusted OR [95% CI]^a	Pval
Sociodemographic factors				
Female vs. male	2.10 [1.39-3.25]	<.0001	1.91 [1.23-2.946]	0.004
Age (years)	1.03 [0.98-1.07]	0.236		
Academic sector (health sector vs. other)	1.41 [1.04-1.90]	0.026	1.43 [1.04-1.96]	0.029
Living status (alone vs. not alone)	1.15 [0.89-1.50]	0.286		
Healthcare professional among family and friends (yes vs. no)	1.88 [1.39-2.53]	<.0001	1.73 [1.27-2.36]	0.001
Self-evaluated health status				
Chronic disease (yes vs. no)	2.45 [1.76-3.43]	<.0001	2.42 [1.71-3.43]	<.0001
Smoking habit (yes vs. no)	1.85 [1.32-2.59]	<.0001	1.87 [1.32-2.66]	<.0001
Alcohol consumption (yes vs. no)	1.35 [1.00;1.84]	0.049	1.39[0.89;1.90]	0.329
Stress in the previous month	2.99 [1.90-4.70]	<.0001	2.54 [1.60-4.04]	<.0001

^a Adjusted for all the variables that were significant in a univariate analysis

CI: confidence interval; OR: odds ratio